

PTO/SB/21 (08-03)  
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<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	10/708,305	
	Filing Date	02/24/2004	
	First Named Inventor	Tiek-Nyen Lee	
	Art Unit		
	Examiner Name		
Total Number of Pages in This Submission	3	Attorney Docket Number	ACMP0066USA

ENCLOSURES (Check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance communication to Technology Center (TC)
<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input type="checkbox"/> Amendment/Reply	<input type="checkbox"/> Petition	<input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Power of Attorney, Revocation	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Change of Correspondence Address	<input type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Terminal Disclaimer	
<input type="checkbox"/> Information Disclosure Statement	<input type="checkbox"/> Request for Refund	
<input checked="" type="checkbox"/> Certified Copy of Priority Document(s)	<input type="checkbox"/> CD, Number of CD(s) _____	
<input type="checkbox"/> Response to Missing Parts/Incomplete Application	Remarks	
<input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53		

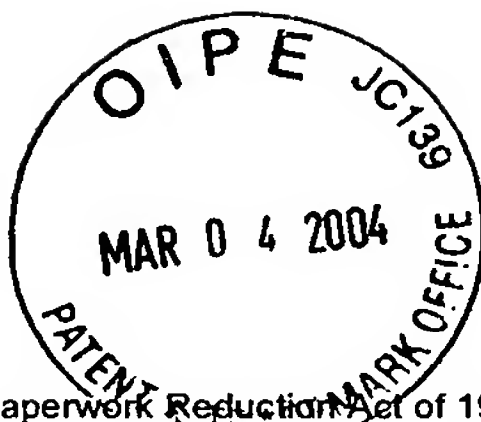
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	Winston Hsu, Reg. No.: 41,526
Signature	
Date	2/26/2004

CERTIFICATE OF TRANSMISSION/MAILING			
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PTO/SB/17 (10-03)  
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# FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$ ) 0.00

## Complete if Known

Application Number	10/708,305
Filing Date	02/24/2004
First Named Inventor	Tiek-Nyen Lee
Examiner Name	
Art Unit	
Attorney Docket No.	ACMP0066USA

## METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 50-0801  
Deposit Account Name: North America International Patent Office

The Director is authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☒ Credit any overpayments

☒ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

## FEE CALCULATION

### 1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	
SUBTOTAL (1)					(\$ ) 0.00

### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims  - 20\*\* =  X  =   
Independent Claims  - 3\*\* =  X  =   
Multiple Dependent  =

Large Entity		Small Entity		Fee Description
Fee Code	Fee (\$)	Fee Code	Fee (\$)	
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ ) 0.00

\*\*or number previously paid, if greater; For Reissues, see above

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for <i>ex parte</i> reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	0.00
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) \_\_\_\_\_

\*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$ ) 0.00

## SUBMITTED BY

(Complete if applicable)

Name (Print/Type)	Winston Hsu	Registration No. (Attorney/Agent)	41,526	Telephone	886289237350
Signature		Date	2/26/2004		

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This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PTO/SB/02B (11-00)  
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## DECLARATION — Supplemental Priority Data Sheet

Additional foreign applications:

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
PI20030880	Malaysia	03/13/2003	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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To:

**MR. HUANG PETER**  
C/O. PETER HUANG & RICHARD  
368 - 1 & 2 , BELLISA ROW,  
JALAN BURMA,  
10350 PULAU PINANG,  
MALAYSIA.

**PATENT APPLICATION NO: PI 2003 0880**

This is to certify that annexed hereto is a true copy from the records of the Registry of Trade Marks and Patents, Malaysia of the application as originally filed which is identified therein.



By authority of the  
REGISTRAR OF PATENTS

  
**ABDUL RAHMAN RAMLI**  
(CERTIFYING OFFICER)  
3 October 2003







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(Intellectual Property Corporation of Malaysia)  
Aras 32, Menara Dayabumi,  
Jalan Sultan Hishamuddin,  
50623 Kuala Lumpur

Telefon: 03-2274 8671  
Fax : 03-2274 1332  
<http://www.mipc.gov.my>


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### CERTIFICATE OF FILING

APPLICANT : BENQ CORPORATION  
APPLICATION NO : PI 20030880  
REQUEST RECEIVED ON : 13/03/2003  
FILING DATE : 13/03/2003  
AGENT'S/APPLICANT'S FILE REF. : PT/04/03HKMK

Please find attached, a copy of the Request Form relating to the above application, with the filing date and application number marked thereon in accordance with Regulation 25(1).

Date : 21/03/2003

  
\_\_\_\_\_  
(ROZLEE BIN ASID)  
for Registrar of Patents

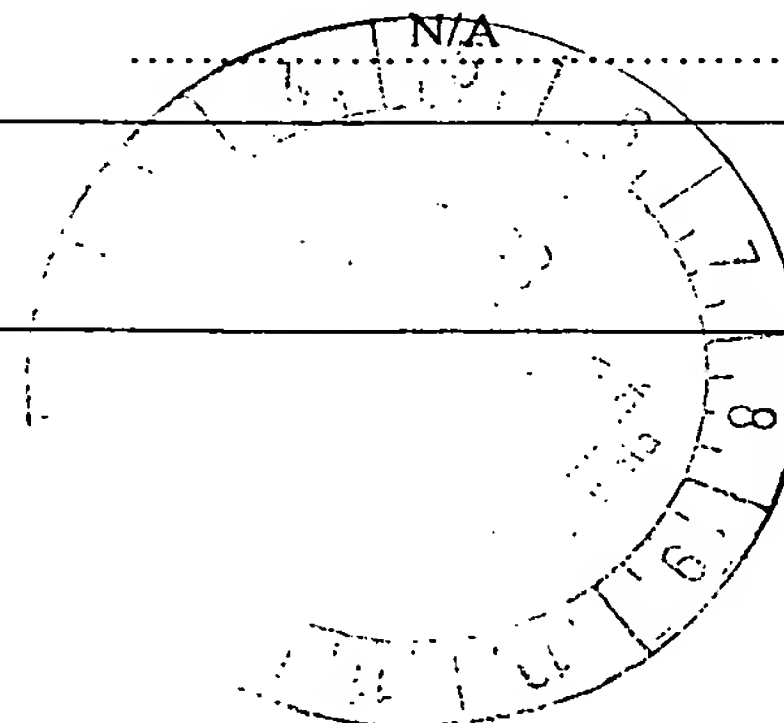
To : KHAW HANG MENG  
C/O PETERHUANG & RICHARD,  
368-3-1 & 2, BELLISA ROW  
JALAN BURMA  
10350 PULAU PINANG  
MALAYSIA



<b>Patents Form No. 1</b> <b>PATENTS ACT 1983</b>  <b>REQUEST FOR GRANT OF PATENT</b> (Regulation 7)  <b>To: The Registrar of Patents</b> <b>Patent Registration Office</b> <b>Kuala Lumpur, Malaysia</b>	<div style="text-align: right;"><b>For Official Use</b></div> APPLICATION NO: <u>P 20030880</u> Filing Date: <u>13.03.2003</u> Application received on: <u>13.03.2003</u> Fee received on: <u>13.03.2003</u> Amount: <u>RM 250</u> *Cheque/Postal Order/Money Order/Draft/Cash No: <u>51428 042746</u>  Date of mailing: _____						
Please submit this Form in duplicate	Applicant's or Agent's File reference: <u>PT/04/03HKmk</u>						
THE APPLICANT(S) REQUEST(S) THE GRANT OF A PATENT IN RESPECT OF THE FOLLOWING PARTICULARS:							
I. TITLE OF INVENTION: <u>PROBE HOLDER</u>							
II. APPLICANT(S) (the data concerning each applicant must appear in this box or, if the space is insufficient, in the space below)							
Name : <u>BenQ Corporation</u> I.C./Passport No: _____ Address : <u>No. 157, Shan-Ying Road, Kweishan, Tao Yuan Hsien</u> <u>Taiwan, R.O.C</u>  Address for service in Malaysia: <u>PETER HUANG &amp; RICHARD</u> <u>368-3-1 &amp; 2 Bellisa Row, Jalan Burma, 10350 Penang</u> Nationality : <u>A company incorporated under the laws of TAIWAN, R.O.C</u>  <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; text-align: center;">Telephone Number (if any)</td> <td style="width: 33%; text-align: center;">Telegraphic Address (if any)</td> <td style="width: 33%; text-align: center;">Teleprinter Address (if any)</td> </tr> <tr> <td style="text-align: center;"><u>(604) 2276862</u></td> <td style="text-align: center;"><u>(604) 2277237 / 2273996</u></td> <td style="text-align: center;"><u>N/A</u></td> </tr> </table>		Telephone Number (if any)	Telegraphic Address (if any)	Teleprinter Address (if any)	<u>(604) 2276862</u>	<u>(604) 2277237 / 2273996</u>	<u>N/A</u>
Telephone Number (if any)	Telegraphic Address (if any)	Teleprinter Address (if any)					
<u>(604) 2276862</u>	<u>(604) 2277237 / 2273996</u>	<u>N/A</u>					
Additional Information (if any) <div style="text-align: center;">N/A</div>							

\* Delete whichever does not apply.

200 30 880



III. INVENTOR

Applicant is the inventor

Yes

☐

No

☒

If the applicant is not the inventor:

Name of inventor :

LEE TIEK-NYEN (a citizen of Malaysia)

Address of inventor :

2686, Jalan Todak, Seberang Jaya, 13700 Prai, Penang  
Malaysia

A statement justifying the applicant's right to the patent accompanies this Form:

Yes

☒

No

☐

Additional Information (if any) **APPLICANT DERIVES TITLE IN THE INVENTION FROM THE INVENTOR BY WAY OF ASSIGNMENT**

IV. AGENT OR REPRESENTATIVE

Applicant has appointed a patent agent in the accompanying Form No. 17.

Yes

☐

No

☐

Agent's Registration Number: PA 92/0027

Applicants have appointed KHAW HANG MENG

to be their common representatives.

V. DIVISIONAL APPLICATION N/A

This application is a divisional application

☐

The benefit of the filing date

☐

priority date

☐

of the initial application is claimed inasmuch as the subject-matter of the present application is contained in the initial application identified below:

Initial Application No.:

Date of filing of initial application:

VI. DISCLOSURES TO BE DISREGARDED FOR PRIOR ART PURPOSES N/A

Additional information is contained in supplemental box

☐

(a) Disclosure was due to acts of applicant or his predecessor in title

Date of disclosure:

(b) Disclosure was due to abuse of rights of applicant or his predecessor in title

Date of disclosure:

(c) Disclosure by way of a pending application to register the patent in the United Kingdom Patent Office

☐

A statement specifying in more detail the facts concerning the disclosure accompanies this Form

Yes

☐

No

☐

Additional Information (if any)

N/A

VII. PRIORITY CLAIM (if any)

The priority of an earlier application is claimed as follows:

Country (if the earlier application is a regional or international application, indicate the office with which it is filed):

N/A

Filing Date : .....

Application No. : .....

Symbol of the International Patent Classification:

If not yet allocated, please tick

☐

The priority of more than one earlier application is claimed.

Yes

☐

No

☐

The certified copy of the earlier application(s) accompanies this Form:

Yes

☐

No

☒

If No, it will be furnished by ..... upon request (date)

Additional Information (if any)

N/A

VIII. CHECK LIST

A. This application contains the following:

- |    |             |             |        |
|----|-------------|-------------|--------|
| 1. | request     |             |        |
| 2. | description | Ten (10)    | sheets |
| 3. | claim       | Four (04)   | sheets |
| 4. | abstract    | One (01)    | sheets |
| 5. | drawings    | Five (05)   | sheets |
|    | Total       | Twenty (20) | sheets |

B. This Form, as filed, is accompanied by the items checked below:

- |     |  |                                     |
|-----|--|-------------------------------------|
| (a) | signed Form No. 17 – to be submitted later   | <input type="checkbox"/>            |
| (b) | declaration that inventor does not wish to be named in the patent                            | <input type="checkbox"/>            |
| (c) | statement justifying applicant's right to the patent   | <input checked="" type="checkbox"/> |
| (d) | statement that certain disclosures be disregarded)   | <input type="checkbox"/>            |
| (e) | priority document (certified copy of earlier application)                                    | <input type="checkbox"/>            |
| (f) | cash, cheque, money order, banker's draft or postal order for the payment of application fee | <input checked="" type="checkbox"/> |
| (g) | other documents (specify)  | <input type="checkbox"/>            |

200 30 880

IX. SIGNATURE

  
KHAWHANG MENG

\*(Applicant/Agent)

06-03-2003

(Date)

If Agent, indicate Agent's Registration No.: PA 92/0027

For Official Use

1. Date application received: .....
2. Date of receipt of correction, later filed papers or drawings completing the application:  
.....

\*Type name under signature and delete whichever does not apply.

DESCRIPTIONTITLE OF INVENTION: PROBE HOLDERBACKGROUND OF THE INVENTION

## 1. Field of the Invention

5 The invention relates to a probe holder, and more particularly, to a probe holder for attaching a testing probe onto a surface utilizing suction generated by an air flow.

## 2. Description of the Prior Art

10 In the last decade, the focus of electronic products has migrated from dedication to purely computational tasks to multi-media applications. Accordingly, demands on the quality and quantity of display devices have grown and that, as a result, has benefited the display panel manufacturing industry.

15 In order to insure that all the display devices (for example, CRT monitors, LCD monitors, LCD panels of PDAs, etc) put on the shelves are quality products, it is critical that a testing procedure is provided after the display panels have been manufactured. By doing so, those panels with flaws  
20 can be located, and fixed or discarded as the situation allows. Conventionally, the testing procedure is executed by utilizing a testing probe. A testing engineer performing the testing procedure grasps the testing probe with his or her hands and moves the testing probe sequentially past  
25 every corner of the panel to be tested. The testing probe then captures a display result of the panel and an analysis





can be done based upon these results. This analysis is used to determine if the tested panel is a product with suitable quality.

However, physically grasping the testing probe has several  
5 major disadvantages. One of them is that human body movements are imprecise and undependable. Holding the testing probe with only the hands during the testing procedure may generate errors in testing results due to random factors generic to the human body, such as respiration, muscle trembling,  
10 etc. Moreover, since the testing procedure is a repetitive, exhausting job, after long testing periods, the testing engineer tends to more easily generate errors during the testing procedure due to physical exhaustion. All of these factors mentioned above cause a drop in testing efficiency,  
15 which is not desirable during the testing procedure.

#### SUMMARY OF THE INVENTION

It is therefore a primary objective of the claimed invention to provide a testing probe holder to solve the above-mentioned problems.

20 According to the claimed invention, a probe holder for holding a testing probe comprises a body; an air inlet positioned on the body for inputting an air flow; a first airway embedded in the body and connected to the air inlet at a first opening of the first airway for providing a conduit  
25 for the air flow; a second airway embedded in the body and connected to a second opening of the first airway at a fourth opening of the second airway; a vacuum cup positioned on the body and connected to a fifth opening of the second airway, the vacuum cup adapted for contacting a surface



to provide suction at the surface; an air outlet positioned on the body and connected to a third opening of the first airway for outputting the air flow; and a holding portion installed on the body for holding the testing probe.

- 5 The present invention probe holder includes a first airway as a conduit for an air flow, a second airway as connection between the first airway and a vacuum cup, and the vacuum cup for contacting a surface to provide suction at the surface. According to Bernoulli's theorem, a low-pressure condition  
10 is generated in the second airway and at the vacuum cup when the air flow flows through the first airway under the above-mentioned setup. The present invention probe holder further includes a holding portion for holding a testing probe. Together, the testing probe can attach to a surface  
15 to be tested easily and steadily, and the problem shown in the prior art is resolved by utilizing the present invention probe holder.

These and other objectives of the claimed invention will no doubt become obvious to those of ordinary skill in the  
20 art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram of a probe holder according to the present  
25 invention when an air flow is vented at an air outlet.

Fig. 2 illustrates detaching a vacuum cup depicted in Fig. 1 according to the present invention.

Fig. 3 is a diagram of an air outlet actuator according to



present invention.

Fig.4 is an operating diagram of a probe holder according to present invention when the probe holder attaches to a surface to be tested.

- 5 Fig.5 is a diagram of a preferred embodiment of a probe holder according to the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- Please refer to Fig.1. Fig.1 is a diagram of a probe holder 10 according to present invention when an air flow is vented at an air outlet. In Fig.1, the probe holder 10 comprises a body 12; an air inlet 14 positioned on the body 12 for inputting an air flow, as shown in the figure; a first airway 16 embedded in the body 12 and connected to the air inlet 14 at a first opening 26 of the first airway 16 for providing a conduit for the air flow; a second airway 18 embedded in the body 12 and connected to a second opening 28 of the first airway 16 at a fourth opening 32 of the second airway 18; a vacuum cup 20 positioned on the body 12 and connected to a fifth opening 34 of the second airway 18. The vacuum cup 20 is adapted for contacting a surface (not shown in Fig.1) to provide suction at the surface; an air outlet 22 positioned on the body 12 is connected to a third opening 30 of the first airway 16 for venting the air flow, as shown in the figure; and a holding portion 24 is installed on the body 12 for holding a testing probe (not shown in Fig.1).

For the present invention, the air inlet 14, the first airway 16, and the second airway 18 can be tubes installed inside the body 12, and such a setup also falls within the scope



of the claimed present invention. Furthermore, the holding portion 24 can be a receiving space in the body 12 for inserting the testing probe. Alternatively, the holding portion 24 may be a clamp affixed to the body 12 for holding a probe (not shown), or the like. It should be understood that these exemplary setups are given as preferred embodiments and are not meant to be limiting.

According to Bernoulli's theorem, when the air flow flows from the air inlet 14 through the first airway 16, and is vented at the air outlet 22, a low pressure condition is generated in the second airway 18, and hence in the vacuum cup 20. At this time, in conjunction with a rim of the vacuum cup 20 being in proper contact with a surface (which can be, for example, a display panel to be tested), suction at the surface, strong enough to endure the weight of the probe holder 10 plus the weight of the testing probe, is provided by the air flow flowing through the first airway 16. Hence, in order to successfully provide the suction needed, the second airway 18 is connected to the first airway 16 with an angle  $\theta_1$  (as shown in Fig.1) such that the air flow through the first airway 16 generates a desired low pressure condition in the second airway 18 and in the vacuum cup 20.

To accomplish the goal mentioned above, the angle  $\theta_1$  of the second airway 18 to a direction of the air flow through the first airway 16 flowing past the second airway 18 is preferably equal to or larger than ninety degrees. An inner diameter of the air inlet 14 is preferably larger than an inner diameter of the first airway 16, such that an air pressure of the air flow increases as long as the air flow passes the first opening 26 and flows inside the first airway





16. Furthermore, an inner diameter of the second airway 18 is preferably smaller than an inner diameter of the first airway 16. All these preferable conditions stated above in this paragraph contribute to the same goal of ensuring  
5 the generation of the low-pressure condition in the second airway 18 and in the vacuum cup 20.

Also, in order to provide the air flow flowing in the first airway 16, an air flow input is installed at the air inlet 14, and the air flow input at the air inlet 14 is capable  
10 of being connected to a compressed air source. The air flow input can be, for example, an air tube that is adapted to be connected to an air hose coming out of the compressed air source.

The operating principles for attaching the probe holder  
15 10 to a surface have been described in previous paragraphs. Now please refer to Fig.2, which illustrates the operating principles of detaching the probe holder 10 from a surface. Fig.2 is a diagram of the probe holder 10 in Fig.1 according to present invention when the air flow is blocked at the  
20 air outlet 22. Now consider a situation that the probe holder 10 has been attached to a surface by way of the vacuum cup 20 due to the air flow. As shown in Fig.2, at this time if the air flow is flowing from the air inlet 14 through the first airway 16, but now the air outlet 22 is blocked  
25 (for example, by a finger), the air flow then has no choice but to flow out of the first airway 16 through the second airway 18 and the vacuum cup 20. This phenomenon creates a high pressure condition rather than a low one in the second airway 18 and in the vacuum cup 20, and as a result, suction  
30 at the vacuum cup 20 is no longer provided. This achieves the goal of detaching the probe holder 10 from the surface.



Of course, even partially blocking the air outlet 22 may be sufficient to eliminate the suction within the vacuum cup 20, and hence detach the probe holder 10 from the surface.

In order to permit modifying of venting of the air outlet 22, the air outlet 22 is designed to be capable of being blocked by a finger. Also, the present invention probe holder 10 can further comprise an air outlet actuator installed on the air outlet 22 for controlling the outflow of the air flow from the air outlet 22. One example of such an air outlet actuator is given in Fig.3. Fig.3 is an air outlet actuator 36 according to present invention. The air outlet actuator 36 is installed on the air outlet 22 and comprises a blocking portion 38 and a plurality of springs 40 (in Fig.3, there are two springs 40 shown). The blocking portion 38 has a pushing end adapted to be pushed by a finger, and a blocking end capable of fully blocking the venting of the air flow at the air outlet 22. The blocking portion 38 is connected to the air outlet 22 through the springs 40 in an elastic manner, as shown in Fig.3. Please note, it should be understood that the air outlet actuator 36 in Fig.3 is given as a preferred embodiment and is not meant to be limiting.

Please refer to Fig.4. Fig.4 is an operating diagram of a probe holder 10 according to the present invention when the probe holder 10 attaches to a surface to be tested. The surface to be tested can be a display panel under test, as shown in Fig.4. Therefore, the vacuum cup 20 of the probe holder 10 is adapted to contact a display panel to be tested. According to Fig.4, it is clear that through the use of the present invention probe holder 10 in conjunction with proper operation, a testing probe can be steadily and



effortlessly attached to a surface (for example, a display panel) to be tested. Here, since the whole body of the present invention probe holder 10 has a high probability of getting close to or in contact with the display panel to be tested during operation, the body 12 of the probe holder 10 is preferably made of a non-metallic material to avoid possible damages (such as scratches) to the display panel, and the body 12 of the probe holder 10 is also preferably made of a non-magnetic material to avoid possible interference during testing read-outs.

Furthermore, please note that though Fig. 1 and Fig. 2 depict the air outlet 22, and therefore a direction of the second airway 18, being positioned on the same side of the body 12 as the vacuum cup 20, this does not preclude the possibility of the air outlet 22 being positioned at a different location of the probe holder 10 from that shown, and is considered an implementation choice.

Please refer to Fig. 5. Fig. 5 is a diagram of a second preferred embodiment of a probe holder 50 according to the present invention. The probe holder 50 is used for attaching a testing probe affixed in the receiving space 24 onto a surface (not shown in Fig. 5). The probe holder 50 comprises a body 52, a first airway 56, a second airway 58, and a vacuum cup 60. The first airway 56 is formed within the body 52 and extending along a first axis  $A_1$ . The first airway 56 has an air inlet 54, an air outlet 62, and a midpoint opening 68. The midpoint opening 68 is formed between the air inlet 54 and the air outlet 62. The second airway 58 is formed within the body 52 and extending along a second axis  $A_2$ . The second airway 58 communicates with the first airway 56 through the midpoint opening 68, and the second airway



- 58 has a surface opening 74 formed on a surface of the body 52. The angle  $\theta_2$  defined between the first axis  $A_1$  and the second axis  $A_2$  is less than or equal to ninety degrees. The vacuum cup 60 is disposed around the surface opening 74.
- 5 The vacuum cup 60 has an inner space 76 communicating with the second airway 58 through the surface opening 74. When an air flow is flowing from the air inlet 54 towards the air outlet 62, the air flow draws air from the second airway 58 through the midpoint opening 68, so that the air pressure
- 10 of the inner space 76 of the vacuum cup 60 is reduced to allow attaching of the testing probe onto the surface. Note here that direction of the first axis  $A_1$  and direction of the second axis  $A_2$  are defined by arrowheads shown in Fig. 5, respectively, and the angle  $\theta_2$  is then defined accordingly.
- 15 Similar to the first preferred embodiment, the inner diameter of the second airway 58 is smaller than the inner diameter of the first airway 56. Besides, the diameter of the air outlet 62 is small enough, so the air outlet 62 is dimensioned to be substantially blocked by the operator's finger. When
- 20 the air outlet 62 is blocked by operator's finger, then outflow of the air flow from the air outlet 58 is substantially reduced, and the air pressure within the vacuum cup 60 will increase. Further more, an air outlet actuator shown in Fig. 3 can be installed on the air outlet 62 for controlling
- 25 the outflow of the air flow from the air outlet 58.

In contrast to the prior art, the present invention probe holder includes a first airway as a conduit for an air flow, a second airway as a connection between the first airway and a vacuum cup, and the vacuum cup for contacting a surface

30 to provide suction at the surface. According to Bernoulli's theorem, a low-pressure condition is generated in the second





airway and at the vacuum cup when the air flow flows through the first airway. The present invention probe holder further includes a holding portion for holding a testing probe. Together, the testing probe can attach to a surface to be  
5 tested easily and steadily, and the problem noted in the prior art is resolved by utilizing the present invention probe holder.

Those skilled in the art will readily observe that numerous modifications and alterations of the device may be made  
10 while retaining the teachings of the invention. Accordingly, that above disclosure should be construed as limited only by the metes and bounds of the appended claims.



CLAIMS

What is claimed is:

1. A probe holder for holding a testing probe, the probe holder comprising:
  - 5       a body;  
          an air inlet positioned on the body, for inputting an air flow;  
  
          a first airway embedded in the body and connected to the air inlet at a first opening of the first airway  
10       for providing a conduit for the air flow;  
  
          a second airway embedded in the body and connected to a second opening of the first airway at a fourth opening of the second airway;  
  
          a vacuum cup positioned on the body and connected to  
15       a fifth opening of the second airway, the vacuum cup adapted for contacting a surface to provide suction at the surface;  
  
          an air outlet positioned on the body and connected to  
20       a third opening of the first airway for venting the air flow; and  
  
          a holding portion installed on the body for holding the testing probe.
2. The vacuum probe holder of claim 1 wherein the second airway is connected to the first airway with an angle



such that the air flow through the first airway generates a low pressure condition in the second airway and in the vacuum cup.

3. The vacuum probe holder of claim 2 wherein the angle  
5 of the second airway to a direction of the air flow through the first airway flowing past the second airway is equal to or larger than ninety degrees.
4. The vacuum probe holder of claim 1 wherein the first and the second airways are tubes.
- 10 5. The vacuum probe holder of claim 4 wherein an inner diameter of the air inlet being larger than an inner diameter of the first airway.
6. The vacuum probe holder of claim 4 wherein an inner diameter  
15 of the second airway is smaller than an inner diameter of the first airway.
7. The vacuum probe holder of claim 1 wherein the air outlet is capable of being blocked by a finger to modify outflow of the air flow from the air outlet.
8. The vacuum probe holder of claim 1 further comprising  
20 an air outlet actuator installed on the air outlet for controlling the outflow of the air flow from the air outlet.
9. The vacuum probe holder of claim 1 wherein the body is made of a non-metallic material.
- 25 10. The vacuum probe holder of claim 1 wherein the body is



made of a non-magnetic material.

11. The vacuum probe holder of claim 1 wherein the holding portion is a receiving space in the body for inserting the testing probe.

5 12. A probe holder for attaching a testing probe onto a surface, the probe holder comprising:

a body;

10 a first airway formed within the body and extending along a first axis, the first airway having an air inlet, an air outlet, and a midpoint opening, the midpoint opening formed between the air inlet and the air outlet;

15 a second airway formed within the body and extending along a second axis, the second airway communicating with the first airway through the midpoint opening, the second airway having a surface opening formed on the body surface, an angle between the first axis and the second axis being less than or equal to ninety degrees; and

20 a vacuum cup disposed around the surface opening, the vacuum cup having an inner space communicating with the second airway through the surface opening;

25 wherein when an air flow is flowing from the air inlet toward the air outlet, the air flow draws air from the second airway through the midpoint opening so that the air pressure of the inner space of the vacuum cup is reduced to attach the testing probe onto the surface.





13. The probe holder of claim 12 wherein an inner diameter of the second airway is smaller than an inner diameter of the first airway.
- 5 14. The probe holder of claim 12 wherein the diameter of the air outlet dimensioned to be substantially blocked by a finger, so that the outflow of the air flow from the air outlet being substantially reduced when the air outlet being blocked by the finger.
- 10 15. The probe holder of claim 12 further comprising an air outlet actuator installed on the air outlet for controlling the outflow of the air flow from the air outlet.



ABSTRACTTITLE OF INVENTION: PROBE HOLDER

A probe holder includes a body; an air inlet positioned on the body for inputting an air flow; a first airway embedded  
5 in the body and connected to the air inlet for providing a conduit for the air flow; a second airway embedded in the body and connected to the first airway; a vacuum cup positioned on the body and connected to the second airway, the vacuum cup being used to contact a surface to provide  
10 suction at the surface; an air outlet positioned on the body and connected to the first airway for venting the air flow; and a holding portion installed on the body for holding a testing probe.



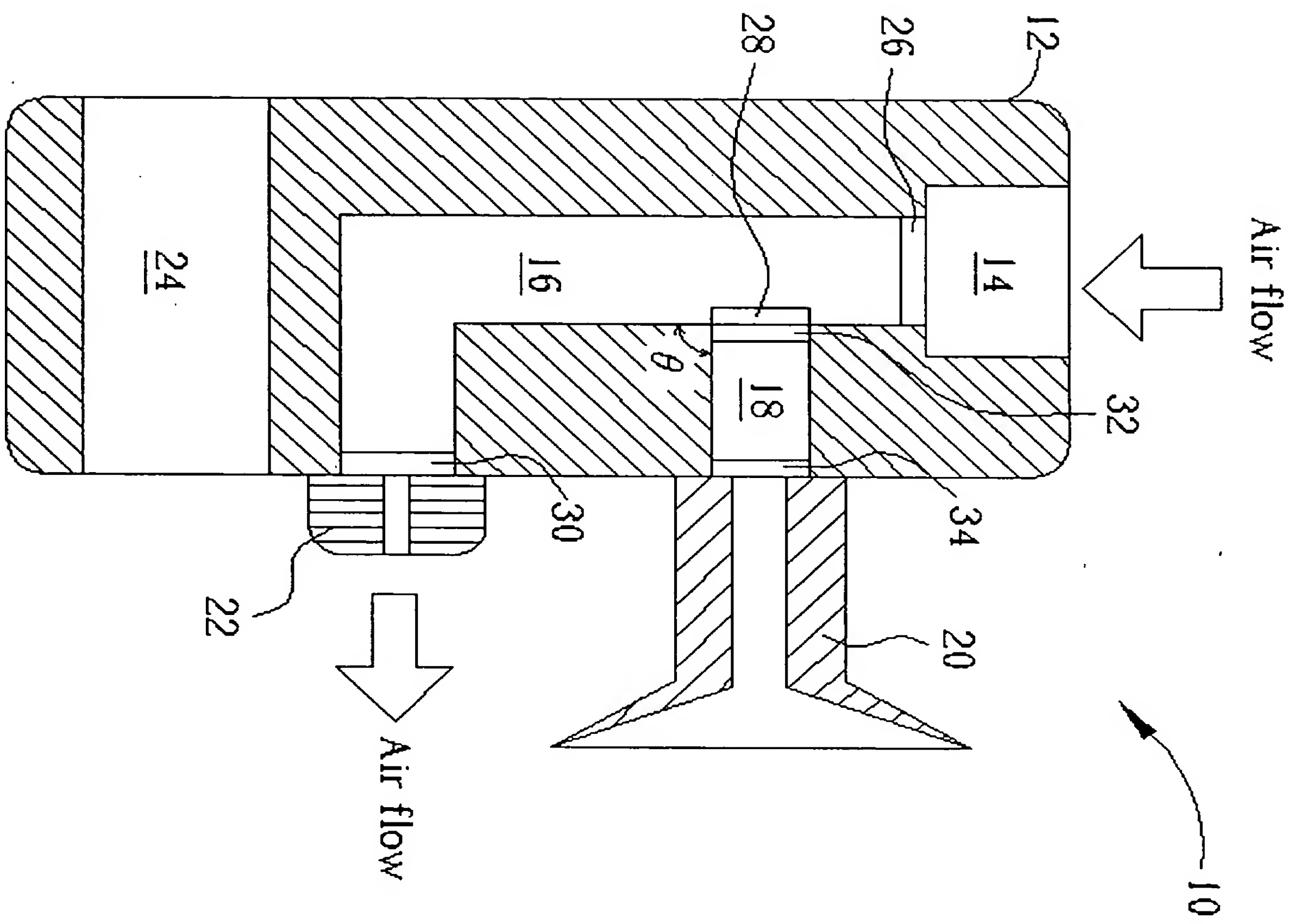


Fig. 1



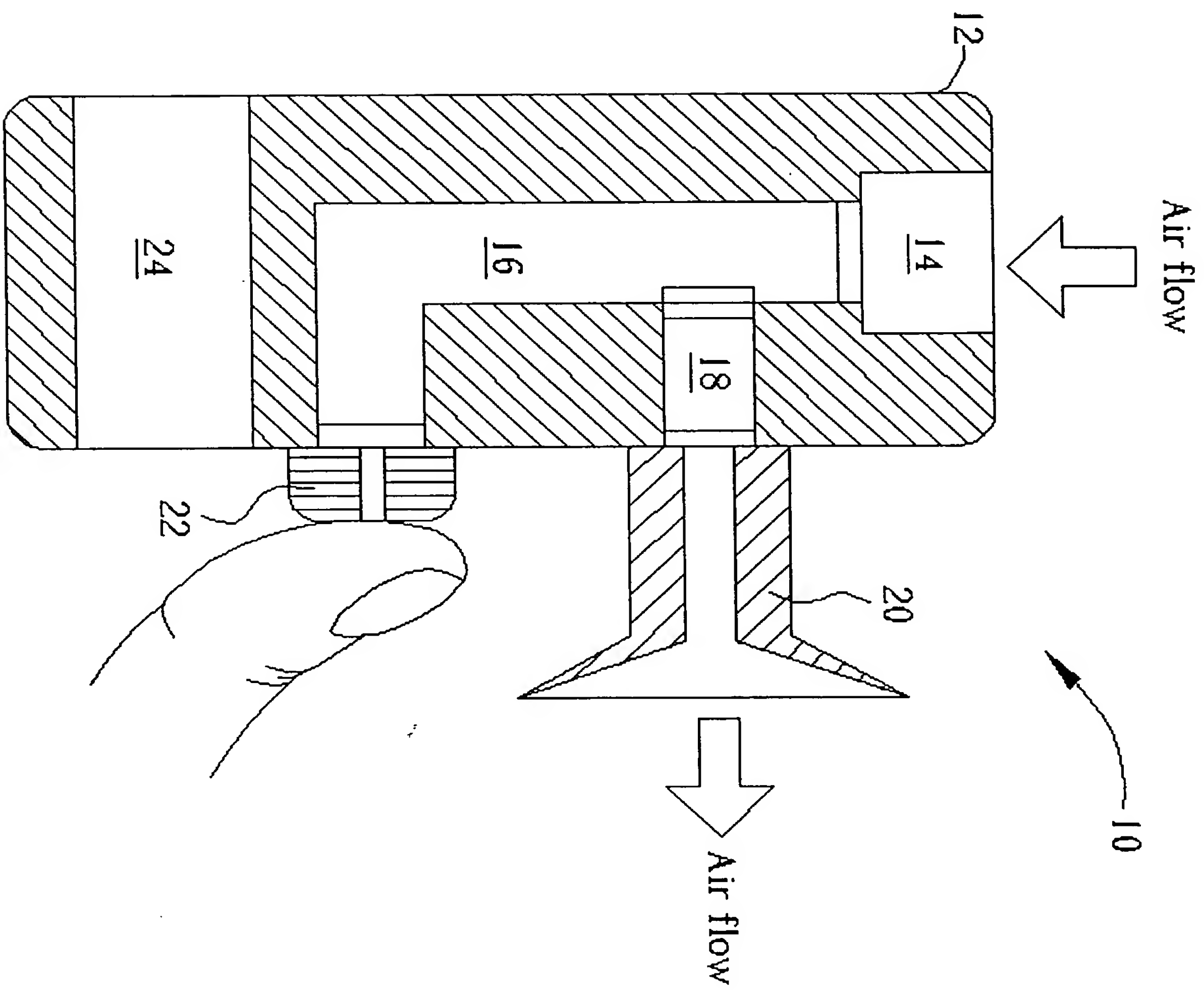


Fig. 2





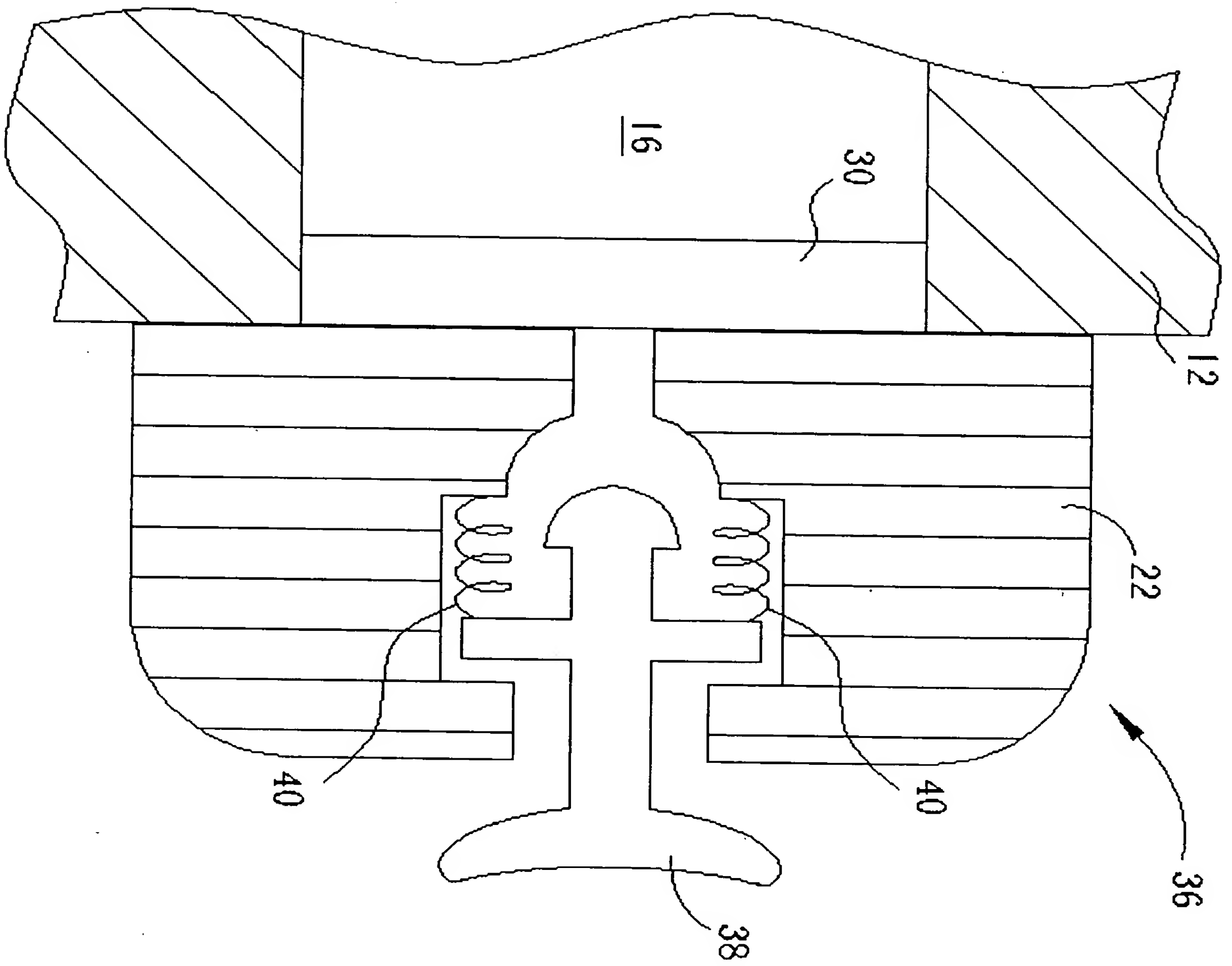


Fig. 3



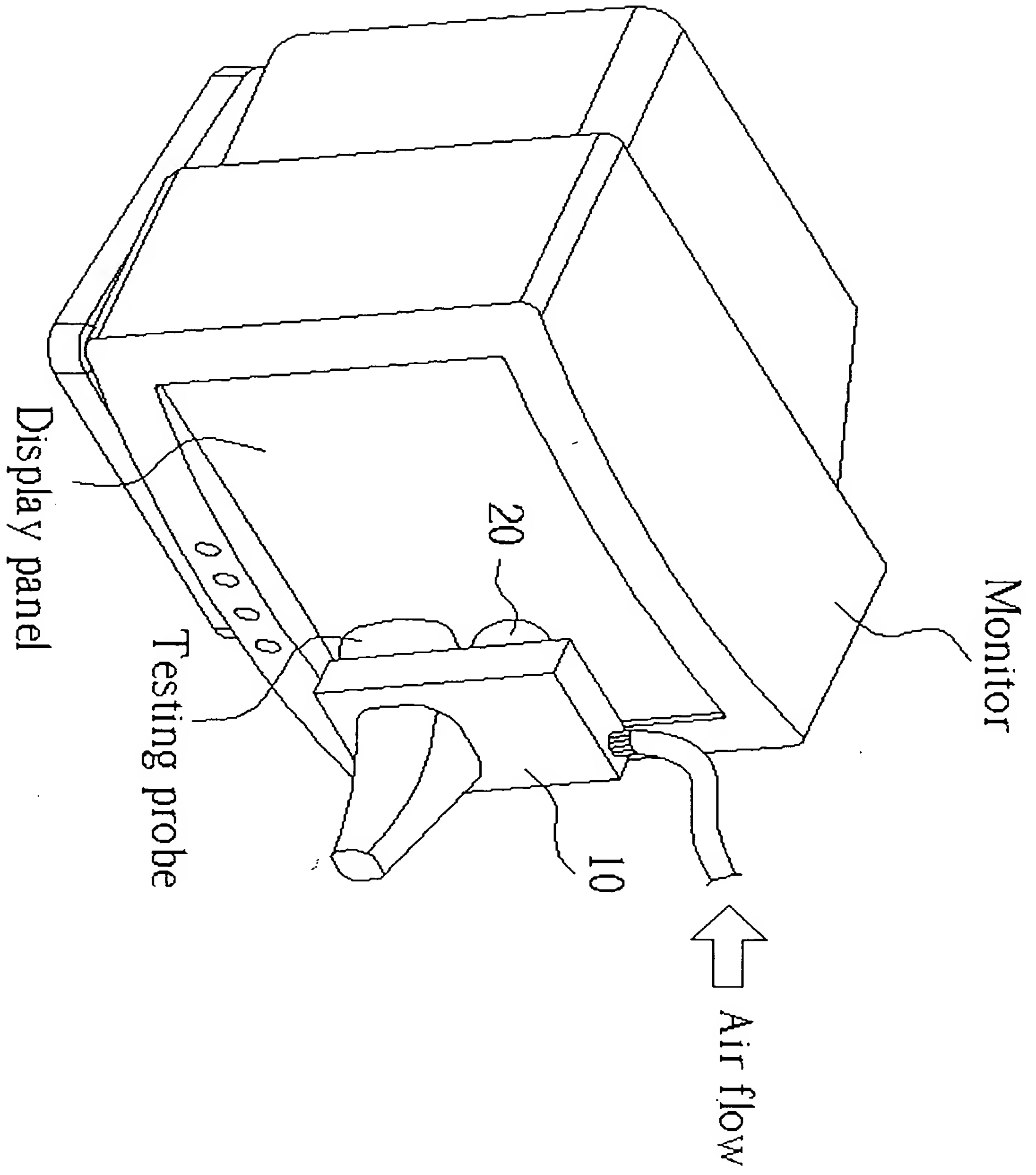


Fig. 4



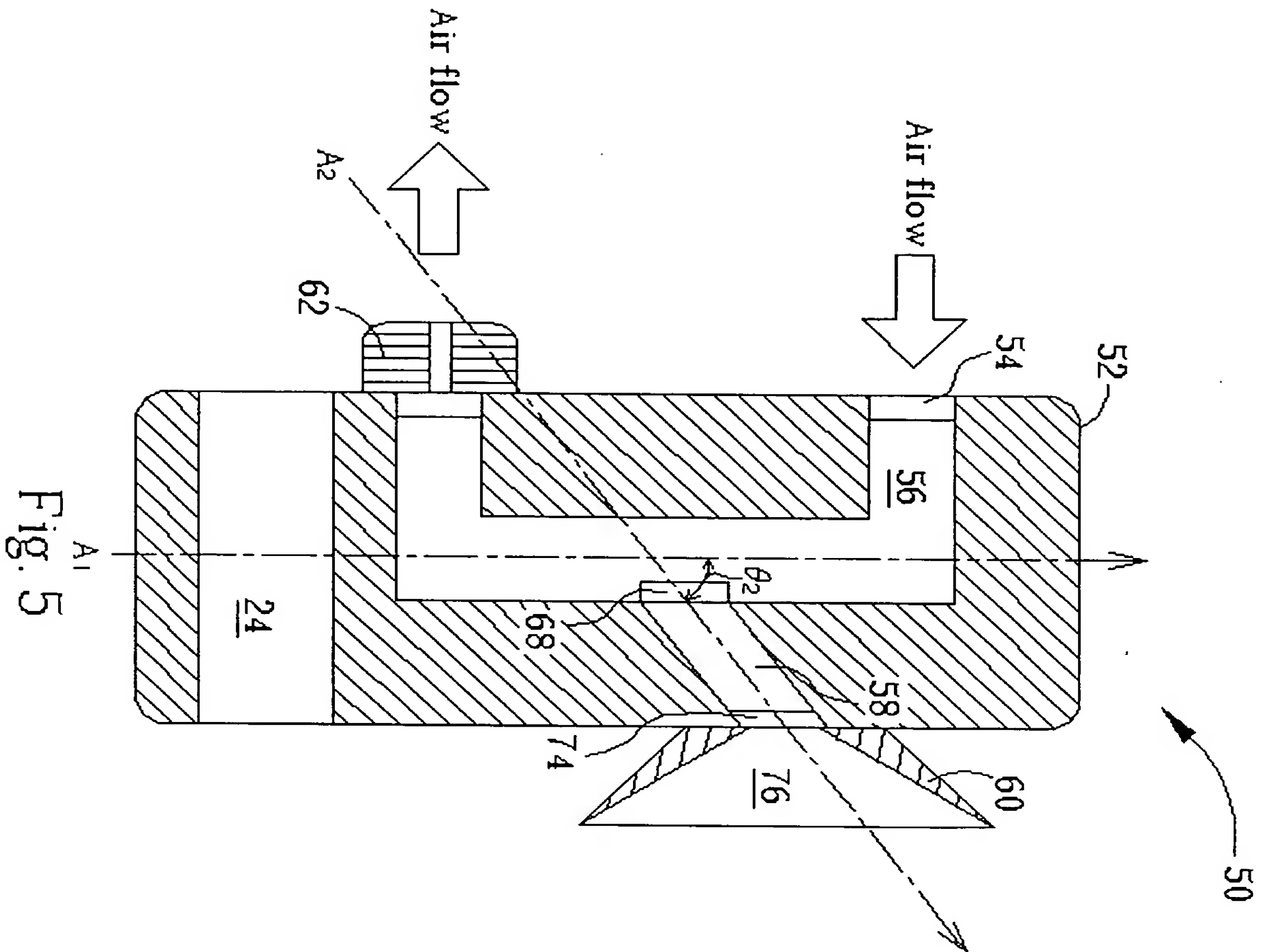


Fig. 5

